CLAIMS

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2	<u>I claim</u> :
3	1. An integrated actuator-carriage arm and suspension system for a hard disk drive
4	information storage system-that can be an internal or an external drive, comprising of:
5	a. two platters supported for rotation about an axis, and having thereon two opposite
6	magnetic surfaces;
7	b. six linear stationary micro-rails, that extend from outer perimeter edge towards the
8	center of each said disk,
9	c. two wing shaped actuator-carriage arms that move linearly over said micro rails;
10	d. an actuator member supported for movement relative to said disks and said axis, two
11	pairs of actuators for effecting controlled parallel movements of said members on two
12	different quarters of the disk and said axis concurrently,
13	e. read/write heads-where each read/write head is on the two sides of a continuous
14	surface contact micro-pad, all supported by said actuator member for controlled precision
15	movements in conjunction with said actuation member, movement of said member by said
16	actuator corresponding to movement of said read/write heads adjacent and in a direction that
۱7	is linear motion-tangential to data tracks, but conforming to approach angle of the arcs of said
18	magnetic surface data tracks as a function of actuator geometry to said disk from said axis,
19	and;
20	f. evenly interspaced servo write and detection head members disposed on said member,
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read/write heads relative to said surface of said disk, and

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that function as position detector to generate position signals to indicate the position of said

which have signal lines that connect said magnetic heads and the actuators to the drive electronics board via the connection and moving members.

- two analog voice coil motors that move the said wing shaped two pairs of actuators along two different-independent stationary linear paths of micro-rails, and;
- said analog voice coil motors also have a digital mode-switching from analog to digital mode and back to analog-for skipping data tracks-when micro actuation is not needed.
- 2. The positioning and actuator-carriage arm system as set forth in claim 1, includes two wing shaped pairs of actuators; where each pair moves in unison-parallel to each other.
- 3. The actuator-carriage arm and suspension system as recited in claim 2, wherein said two pairs of actuators that move within their limited range-enable; the distance that each actuator member of these pairs have to cover to be a considerably shorter distance to reach different concentric tracks of the disk.
- 4. The actuator-carriage arm system as recited in claim 3, wherein said two pairs of actuators that are assigned to move only within a limited range, this said distance of back and forth motion is limited for each member to only 1/2 of the distance of the radius of the disk-excluding the non data zone-during operation, thereby; increases each members precision, enables several layers of programs to be loaded faster at boot up, and speeds up the external transfer rate and shortens the overall access-retrieval time of said drive.

by the said R/W heads of the said actuators that are in an asymmetric position; with only less

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than one revolution of the disk.

certain tracks or make micro distance re-positioning.

10. The actuator-carriage arm system as set forth in claim 1, wherein a total of two hundred and seventy two thin film R/W heads and one hundred and thirty six (one micro-pad for two R/W heads,) or -multiples thereof- micro-pads are affixed to the wing shaped actuator-carriage arms, wherein each actuator covers 17 tracks concurrently and there are four evenly interspaced transducers for each track- thereby each member actuator of the pairs; has access in increments of one hundred and forty seven tracks per ½ concentric limited range assigned where concurrent R/W does not have to be made using all of R/W heads at the same time and in another mode R/W is done sequentially, even as actuators remain stationary over a set of

11. The actuator-carriage arm and integrated suspension system as recited in claim 7 and 9, wherein the arc like shaped geometry and plurality of wing shape of the actuator and the double pair configuration of said actuator arms and a series of R/W heads form an arc like path and two wings extend over and conform to the arcs of the data tracks below, thereby; enable an uninterrupted row of complete disk sectors to pass under these said R/W head members, as said R/W heads do not need to be re-positioned frequently-as in the prior art, and therefore enable a parallel data transfer scheme.

12. The actuator-carriage arm and suspension system as set forth in claim 1, wherein both pairs of the actuators and their R/W heads are connected to the drive electronics board, by flexible printed circuit (FPC) board electronic wiring connection that connects actuators and

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15. The actuator-carriage arm and integrated suspension system as recited in claim 14,

the entire or most or data tracks that are located in different parts of the disk area.

1	wherein the low fly height, is in the order of 0.1-0.5 micron above the disk surface.
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3	16. The actuator-carriage arm and suspension system as set forth in claim 1, wherein the disk
4	members have an optimal rpm of 7200 rpm in order to avoid heating.
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6	17. The actuator-carriage arm system as set forth in claim 1, wherein the actuator arms and
7	suspensions with multiple R/W heads, have embedded servo write-detection member heads
8	to enable precise positioning on the disk
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10	18. The actuator-carriage arm and suspension system as set forth in claim 1, wherein the
11	magnetic disk members that are used to write and read information upon, have a protective
12	wear-resistant coating-that is compatible to the micro pads-that protects the magnetic layer
13	and creates a smooth but textured surface with low capillary adhesion-and make R/W heads-
14	independent of air lifting of disk tangential velocity.
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16	19. The actuator-carriage arm and integrated system as recited in claim 18, wherein the
17	independence from air lifting of disk tangential velocity is mainly a combination of functions
18	of the continuous contact of micro-pads, and the constant height feature provided by the
19	stationary micro-rail.
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21	20. The actuator-carriage arm and suspension system as recited in claim 18, wherein the
22	protective wear-resistant layer is preferably titanium di-boride or amorphous nitrided carbon,
23	or chromium, or tungsten and the disk surface has an adhesion reducing texture.